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10/727,138

12/03/2003

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EXAMINER

DO, CHAT C

ART UNIT

PAPER NUMBER

2193

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/727,138	<b>Applicant(s)</b> SAHA ET AL.	
	<b>Examiner</b> Chat C. Do	<b>Art Unit</b> 2193	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 November 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7, 11-13, 15-18, 27-29 and 31-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 11-13, 15-18, 27-29 and 31-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/03/2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. This communication is responsive to Amendment filed 11/12/2009.
2. Claims 1-7, 11-13, 15-18, 27-29 and 31-33 are pending in this application. Claims 1, 3, 5, 16, 27 and 31 are independent claims. In Amendment, claims 8-10, 14, 19-26, 30 and 34 are cancelled. This Office Action is made non-final after a RCE filed 11/12/2009.

### ***Drawings***

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the limitations within all independent claims must be shown or the feature(s) canceled from the claim(s), particularly the structure of computing/performing N-point FFT/IFFT of the signal using first and second stages wherein the second stage employs single un-nested computation loop. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

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application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-7, 11-13, 15-18, 27-29 and 31-33 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Re claim 1, the newly added limitations “first and second sets of butterfly computations stages... wherein the second stage employs single un-nested computation loop” have never fully addressed in the summary or detail of the invention of the original specification in a way that would be able to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention within the context of the claims. Claims 3, 5, 16, 27 and 31 have similar rejection.

Thus, claims 2, 4, 6-7, 11-13, 15, 17-18, 28-29 and 32-33 are also rejected for being dependent on the rejected base claims 1, 3, 5, 16, 27 and 31 respectively.

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6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 5-6 and 16-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 5, the limitation “computer-readable storage medium” is unclear since the specification does not fully address the definition or type of the computer-readable storage medium. For examination purposes, the examiner considers the “computer-readable storage medium” as the tangible medium as RAM, ROM, hard drive, and CD-ROM. Claim 16 has similar rejection.

Thus, claims 6 and 17-18 are also rejected for being dependent on the rejected base claims 5 and 16 respectively.

### ***Claim Rejections - 35 USC § 101***

8. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. Claims 1, 2, 7, 11 and 27-29 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1, 2, 7, 11 and 27-29 cite a method for performing a/an FFT/IFFT in accordance with a predetermined mathematical algorithm. The method claims 1, 2, 7, 11

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and 27-29 to tie to specific machine or apparatus. Even though, these claims mention multiprocessor but they did not provide sufficient structure of the multiprocessor in order to be specific machine or apparatus. Therefore, claims 1, 2, 7, 11 and 27-29 are directed to non-statutory subject matter.

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1-4, 7, 11-13, 15, 27-29 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abel et al. (U.S. 5,991,787) in view of Jaber (U.S. 6,792,441).

Re claim 1, Abel et al. disclose in Figures 1-14 method of processing a digital signal by computing a Fast Fourier Transform (FFT) or Inverse Fast Fourier transform (IFFT) of the digital signal (e.g. abstract, Figures 7 and 11 wherein Figure 7 discloses an IFFT and Figure 11 discloses a FFT), the method comprising the steps of: computing an N-point FFT/IFFT of a signal (e.g. either seen in Figures 7-8 or Figure 11 for IFFT/FFT respectively) using first and second sets of butterfly computational stages (e.g. Figure 4 and Figure 8 wherein the first plurality of butterfly is performed in components 800 and 805), each stage in the second set of stages employing a plurality of butterfly operations (e.g. Figure 8 wherein components 800 and 805 each utilizes radix-2 as the first radix size) wherein each of the butterfly operations in each stage (e.g. components 800, 805,

and 810 in Figure 8) in the second set of stages has a single, un-nested computation loop (e.g. Figure 4 and Figure 8 wherein there is no loopback/feedback for computing the IFFT/FFT).

Abel et al. fail to disclose in Figures 1-14 a method comprising using a multiprocessing computing system having a plurality of processors P to perform the steps and for distributing the plurality of butterfly operations in each stage of the first plurality of stages such that each processor computes an equal number of complete butterfly operations thereby eliminating data interdependency among the parallel processors. However, Jaber discloses in Figures 8-9 a method (e.g. by means of independent and distribute among processors as seen in Figure 8) comprising using a multiprocessing computing system having a plurality of processors P to perform the steps (e.g. Figure 8 or Figure 9 as multiprocessing system for FFT/IFFT) and for distributing the plurality of butterfly operations in each stage of the first plurality of stages such that each processor computes an equal number of complete butterfly operations thereby eliminating data interdependency among the parallel processors (e.g. abstract and col. 3 lines 30-68 wherein the input data is breakdown in block corresponding to each processor for computing Fourier Transform).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add a method comprising using a multiprocessing computing system having a plurality of processors P to perform the steps and for distributing the plurality of butterfly operations in each stage of the first plurality of stages such that each processor computes an equal number of complete butterfly

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operations thereby eliminating data interdependency among the parallel processors as seen in Jaber's invention into Abel et al.'s invention because it would enable to speed up the computation by computing in parallel and simultaneously (e.g. abstract and summary of the invention in cols. 3-4).

Re claim 2, Abel et al. fail to disclose in Figures 1-14 step of distributing butterfly operations in each stage is implemented by assigning to each processor of the multi-processor system respective addresses of memory locations corresponding to inputs and outputs required for each specific butterfly operation assigned to the processor.

However, Jaber discloses in Figures 8-9 step of distributing butterfly operations in each stage is implemented by assigning to each processor of the multi-processor system respective addresses of memory locations corresponding to inputs and outputs required for each specific butterfly operation assigned to the processor (e.g. col. 7 lines 2-30).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the step of distributing butterfly operations in each stage is implemented by assigning to each processor of the multi-processor system respective addresses of memory locations corresponding to inputs and outputs required for each specific butterfly operation assigned to the processor as seen in Jaber's invention into Abel et al.'s invention because it would enable to speed up the computation by computing in parallel and independent from each other (e.g. abstract and col. 6 line 60 to col. 7 line 30).

Re claim 3, it is a system claim having similar limitations of claim 1. Thus, claim 3 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 4, it is a system claim having similar limitations of claim 2. Thus, claim 4 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 5, Abel et al. disclose in Figures 1-14 a computer-readable storage medium whose contents cause a system having a plurality of processors to perform a method of transforming a signal by computing with the plurality of processors a FFT or IFFT of the signal, the method comprising: computing a first plurality of stages of an N-point FFT/IFFT (e.g. first stage of Figure 4); and computing a second plurality of stages of the N-point FFT (e.g. next stage of Figure 4) without employing nested loops (e.g. Figure 4 and Figure 8 wherein there is no loopback/feedback for computing the IFFT/FFT).

Abel et al. fail to disclose in Figures 1-14 the distributing the plurality of butterfly operations in each stage of the second plurality of stages such that each processor computes an equal number of complete butterfly operations thereby eliminating data interdependency. However, Jaber discloses in Figures 8-9 (e.g. by means of independent and distribute among processors as seen in Figure 8) the distributing system (e.g. Figure 8 or Figure 9 as multiprocessing system for FFT/IFFT) the plurality of butterfly operations in each stage of the second plurality of stages such that each processor computes an equal number of complete butterfly operations thereby eliminating data interdependency (e.g. abstract and col. 3 lines 30-68 wherein the input data is breakdown in block corresponding to each processor for computing Fourier Transform).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the distributing the plurality of butterfly

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operations in each stage of the second plurality of stages such that each processor computes an equal number of complete butterfly operations thereby eliminating data interdependency as seen in Jaber's invention into Abel et al.'s invention because it would enable to speed up the computation by computing in parallel and simultaneously (e.g. abstract and summary of the invention in cols. 3-4).

Re claim 6, it has similar limitations cited in claim 2. Thus, claim 6 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 7, Abel et al. further disclose in Figures 1-14 the second plurality of butterfly operations have a radix-2 radix (e.g. component 800 in Figure 8 wherein the component 800 utilizes radix-2 to compute the butterfly computation of IFFT).

Re claim 11, Abel et al. fail to disclose in Figures 1-14 the assigning addresses to each processor comprises inserting a binary digit in an address of a memory location. However, Jaber discloses in Figures 8-9 the assigning addresses to each processor comprises inserting a binary digit in an address of a memory location (e.g. col. 15 lines 4-35).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the assigning addresses to each processor comprises inserting a binary digit in an address of a memory location as seen in Jaber's invention into Abel et al.'s invention because it would enable to speed up the computation by computing in parallel and independent from each other (e.g. abstract and col. 6 line 60 to col. 7 line 30).

Re claim 12, it is a system claim having similar limitations of claim 7. Thus, claim 12 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 13, Abel et al. further disclose in Figures 1-14 computing a first and second stage of  $\log_2 N$  stages of the N- point FFT/IFFT as a single radix-4 butterfly operation (e.g. component 900 in Figure 9).

Re claim 15, it is a system claim having similar limitations of claim 11. Thus, claim 15 is also rejected under the same rationale as cited in the rejection of rejected claim 11.

Re claim 16, it is a computer-readable memory claim having similar limitations of claim 1. Thus, claim 16 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 17, it is a computer-readable memory claim having similar limitations of claim 2. Thus, claim 17 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 18, it is a computer-readable memory claim having similar limitations of claim 11. Thus, claim 18 is also rejected under the same rationale as cited in the rejection of rejected claim 11.

Re claim 27, Abel et al. disclose in Figures 1-14a method of transforming a digital signal (e.g. abstract and col. 1 lines 30-40), the method comprising: compute a first number of butterfly stages of an N-point Fast Fourier Transform (FFT) or Inverse Fast Fourier transform (IFFT) (e.g. abstract, Figures 7 and 11 wherein Figure 7 discloses an

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IFFT and Figure 11 discloses a FFT and either seen in Figures 7-8 or Figure 11 for IFFT/FFT respectively); and compute remaining butterfly stages of the N-point FFT/IFFT with a single iterative loop (e.g. Figure 4 and Figure 8 wherein there is no loopback/feedback for computing the IFFT/FFT).

Abel et al. fail to disclose in Figures 1-14 a multiprocessing computing system having a plurality P of processors and each processor (e.g. Figure 8) computes an equal number of butterfly operations and there is no data dependency between butterflies in a stage of an iteration of the loop. However, Jaber discloses in Figures 8-9 a multiprocessing computing system having a plurality P of processors and each processor computes an equal number of butterfly operations and there is no data dependency between butterflies in a stage of an iteration of the loop (e.g. abstract and col. 3 lines 30-68 wherein the input data is breakdown in block corresponding to each processor for computing Fourier Transform).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add a multiprocessing computing system having a plurality P of processors and each processor computes an equal number of butterfly operations and there is no data dependency between butterflies in a stage of an iteration of the loop as seen in Jaber's invention into Abel et al.'s invention because it would enable to speed up the computation by computing in parallel and simultaneously (e.g. abstract and summary of the invention in cols. 3-4).

Re claims 28-29, Abel et al. fail to disclose in Figures 1-14 the plurality of processors comprises two processors and the first number of butterfly stages consists of

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one stage and the plurality of processors comprises four processors and the first number of butterfly stages consists of two stages. However, Jaber discloses in Figure 8 the plurality of processors comprises two processors and the first number of butterfly stages consists of one stage (e.g. Figure 8 with only two processors A and B) and the plurality of processors comprises four processors and the first number of butterfly stages consists of two stages (e.g. Figure 8 with only four processors as indicated by dot ....).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the plurality of processors comprises two processors and the first number of butterfly stages consists of one stage and the plurality of processors comprises four processors and the first number of butterfly stages consists of two stages as conceptually seen in Jaber's invention into Abel et al.'s invention because it would enable to reduce the computational burden in signal processing (e.g. col. 1 lines 44-52).

Re claim 31 it is a system claim having similar limitations of claim 27. Thus, claim 31 is also rejected under the same rationale as cited in the rejection of rejected claim 27.

Re claim 32 it is a system claim having similar limitations of claim 28. Thus, claim 32 is also rejected under the same rationale as cited in the rejection of rejected claim 28.

Re claim 33 it is a system claim having similar limitations of claim 29. Thus, claim 33 is also rejected under the same rationale as cited in the rejection of rejected claim 29.

***Response to Amendment***

12. The amendment filed 11/12/2009 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

Re claims 1, 3, 5, 16, 27 and 31, the limitations “first and second sets of butterfly computations stages... wherein the second stage employs single un-nested computation loop” within these claims are not fully described in the original specification which introduce new matter into the disclosure of the invention.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Response to Arguments***

13. Applicant's arguments filed 11/12/2009 have been fully considered but they are not persuasive.

a. The applicant argues in page 10 for claims rejected under 35 U.S. 112<sup>th</sup> 2<sup>nd</sup> paragraph that the computer readable storage medium is seen in page 5 lines 17-21.

The examiner respectfully submits that the specification, particularly page 5 lines 17-21, merely mentions the computer readable storage medium but does not define or address the type of storage medium. Since the specification does not define the storage medium, the examiner takes the broadest interpretation of the

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storage medium as tangible medium as RAM, ROM, hard drive, and CD-ROM in order to be statutory.

- b. The applicant argues in pages 11-12 for claims rejected under 35 U.S.C. 101 that the method claims comprising using a multiprocessor computing system. Thus, they should be statutory.

The examiner respectfully submits that the method claims must tie to specific machine or apparatus in order to realize the implementation. Merely having or using the multiprocessor computing system would not constitute as the specific machine or apparatus since fail to provide specific detail structure of the multiprocessor computing system within the feature of the claims.

- c. The applicant argues in pages 13-22 for claims that the multiprocessors of the secondary reference cannot anticipate the missing limitations from the primary reference since it does not meet all the scenarios and further coefficients are required among the processors.

The examiner respectfully submits that secondary reference does not need to meet all the scenarios as described in pages 13-22 by the applicant as long as it can anticipate the broadest interpretation of the claimed language which is able to process number of equal butterfly operations within the stage. As you can see in Figure 8 there is no feedback structure among the processors while processing the

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butterfly operations. The only related data is the coefficients which are stored previously in the coefficient memory.

d. The applicant argues in pages 23-24 for all independent claims that the secondary reference fails to disclose the limitations "means for distributing the butterfly operations in each stage of the second plurality of stages such that each processor compute an equal number of complete operations thereby eliminating data interdependency in the second stage".

The examiner respectfully submits that the above limitations are clearly seen within Figures 8-9 wherein there is no interchange data between the processors within the stage.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHAT C. DO whose telephone number is (571)272-3721. The examiner can normally be reached on Tue-Fri 9:00AM to 7:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lewis Bullock can be reached on (571) 272-3759. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Chat C. Do/  
Primary Examiner, Art Unit 2193

January 31, 2010